

2016 Porter Medal Winner

I am delighted to announce **Professor Frederick D. Lewis** of Northwestern University as the Porter Medalist for 2016. Fred has been a leading figure in the field of organic photochemistry for more than four decades. He has achieved a truly outstanding level of accomplishment in basic research, in teaching and mentoring students and postdocs, and in service to the profession, both nationally (to the American Chemical Society in particular) and internationally (to IUPAC, the International Union of Pure and Applied Chemistry, especially).



Fred's initial research on the photochemistry of aryl alkyl ketones helped establish the working paradigms for excited state reactivity of organic compounds, elegantly and convincingly demonstrating that intramolecular gamma-hydrogen abstraction reactions are subject to entropic control and that competitive photochemical processes could be subject to ground state conformational control.

Fred then explored the role of excited state complexes (excimers, exciplexes, and radical ion pairs) in photochemical addition and isomerization reactions. He was among the first to establish a connection between the photophysical properties of exciplexes and their chemical behavior (with Siegfried Schneider). Fred also conducted the first systematic studies of the use of Lewis acid complexation and intramolecular hydrogen bonding to control photochemical behavior, along with the use of infrared lasers to effect selective thermal isomerization reactions (with Eric Weitz). He was also the first to explore the potential energy surfaces involved in the unimolecular isomerization reactions of styrenes, vinyl-biphenyls, and related aryl olefins. Fred's research on these fundamental photochemical reactions was recognized by the Inter-American Photochemical Society in 2003, with its Award in Photochemistry.

Later in his career, in a synergistic series of experiments, with Northwestern colleague Robert Letsinger, Fred observed selective fluorescence quenching of stilbene-dicarboxamide by guanine in stilbene-linked hairpins possessing a single GC base pair separated from the stilbene by a variable number of AT base pairs. In collaboration with another Northwestern colleague Michael Wasielewski, the distance dependence of the photoinduced charge separation and charge recombination processes in these hairpins was determined using femtosecond time-resolved spectroscopy. Their initial studies established that DNA is a better

medium for electron transfer than are proteins, but they also established that DNA is not a molecular wire, a very important result. Extensions of this methodology have been employed to establish the dynamics and mechanism of charge transport in DNA and its dependence upon DNA base sequence and structure.

Fred's contributions to our understanding of photochemical reactivity are notable both for their scope and for their adaptation and application of diverse methodologies for solving complex mechanistic problems. Rather than concentrate on a single reaction or spectroscopic technique, he continues to explore new ideas and new experimental methodologies. His highly effective collaboration with spectroscopists and theoreticians has enabled him to successfully tackle highly complex problems. Fred generously acknowledges the contributions of others to these studies, but it is clear that the conception, planning, and coordination of this research are uniquely his. Fred has been the driving force for many significant scientific advances in photochemistry and beyond.

Frederick D. Lewis – Short Biography
May 11, 2016

Fred Lewis has applied the methods of physical organic chemistry and spectroscopy to the study of photochemical reactions in a career that spans nearly five decades. He has also played a leadership role in the international photochemical community. After receiving his training at Amherst College, Rochester (with W. H. Saunders, Jr.), and Columbia (with N. J. Turro), he joined the faculty at Northwestern University in 1969. His initial research at Northwestern established the application of entropic and enthalpic control to photo-chemical reactions. Subsequent work on inter- and intramolecular addition reactions helped define the role of excited state complexes (exciplexes) as intermediates in these reactions and introduced the use of Lewis acid catalysis for photochemical synthesis. For the past two decades Lewis and his collaborators have investigated the dynamics and mechanism of photoinduced injection and transport of positive and negative charge (holes and electrons, respectively) in synthetic DNA hairpins using a combination of molecular design, ultrafast spectroscopy, and theory. He has served as chair of the Gordon Research Conference on Photochemistry and the IUPAC Symposium on Photochemistry and on the editorial boards of several journals including the *Journal of the American Chemical Society*. He is the recipient of the IAPS Award in Photochemistry and the Josef Michl ACS Award in Photochemistry, a fellow of the AAAS and the American Chemical Society, and an Arthur C. Cope Scholar.